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Remarks

Claims 5-8 are pending.

Claims 5-8 stand rejected.

Claim 5 has been amended.

Claims 5-8 are presented herein for further review.

In paragraph 2 of the Office Action, the Examiner has objected to the abstract for excessive length and claim language. Applicants have amended the abstract accordingly and respectfully request that this objection be withdrawn.

In paragraph 4 of the Office Action, the Examiner has rejected claim 5 under 35 U.S.C. § 112 for being indefinite because of the inclusion of the last element "or is lying in at least one turn." Although Applicants disagree that such element is indefinite, for the purposes of expediting the prosecution of this application, Applicants have removed this element from claim 5, and respectfully request that the rejection of this claim be withdrawn.

In Paragraph 6 of the Office Action, the Examiner has rejected claims 5-8 under 35 USC § 103(a) as being unpatentable over Hirose et al. (U.S. Patent No. 6,718,618) in view of Japanese Patent Publication No. (09-134,624). Applicants respectfully disagree with the Examiner and present the following remarks in response.

As noted in the previous Amendment, the present invention as claimed in claim 5 is directed to a process for the production of a superconducting cable having a single cable core, which contains at least one elongated superconducting element, and a flexible tube surrounding the cable core.

The process includes continuously pulling the single cable core from a supply unit, continuously pulling a metal strip from a strip supply unit, continuously forming a slotted tube around the cable core with the metal strip to form a slotted tube, welding a longitudinal slot of the slotted tube shut, and corrugating the welded tube with the cable core inside the tube.

The inside diameter of the corrugated tube is larger than the outside diameter of the cable core to form a semi-finished superconducting cable, which is wound in at least one turn on a drum, and ***where the ends of the cable core are mechanically joined to the ends of the corrugated tube while the cable is on the cable drum***.

Such an arrangement provides a distinct advantage over prior art systems.

For example, as noted in the previous Amendment, in prior art systems, when superconducting cables are in the operating state and the superconductor and the cable elements surrounding it are at the temperature of the liquid helium or of the liquid nitrogen, they become shorter than the external cable elements, which are at ambient temperature. To prevent this decrease in length, fittings are provided at both ends of the cable to connect the individual cable elements non-positively to each other and thus to prevent the inner cable elements from becoming shorter than the outer cable elements. (See paragraph [0008] of the corresponding publication). The associated increase in tensile stress on the conductor core(s) however leads to a decrease in performance.

The present invention takes advantage of the fact that the conducting cores are less flexible than the corrugated metal tubes formed around the core. Because of the way the cable core is designed, it is much stiffer than the corrugated tube. The cable core therefore lies against

the inside surface of the radially outer part of the wall of the corrugated tube; that is, the turns of the cable core try to assume the largest possible diameter. As noted in claim 5, the inside diameter of the corrugated tube is larger than the outside diameter of the cable core, causing the length of the cable core located inside the corrugated tube is greater, relative to the center axis in question, than the length of the corrugated tube. ***By connecting the ends of the cable core to the ends of the corrugated tube while the superconducting cable is on the cable drum, there is an excess length of the cable core in the corrugated tube.*** When the superconducting cable is unwound later from the cable drum, either the corrugated tube stretches by an amount which corresponds to this excess, or the cable core comes to rest at intervals against the inside wall of the corrugated tube in a wave-like manner. When the superconducting cable is operating, i.e., when it is at the temperature of liquid nitrogen, the increase in the length of the corrugated tube is reversed or the wavy form of the cable core is lost, but without the resulting tensile stresses present in the prior art. (See paragraph [0011] of the corresponding publication).

Thus, it can be seen that in the present invention, the excess length is made by mechanical means and without using liquid nitrogen.

The cited prior art does not show such a system.

Hirose, the reference cited previously by the Examiner does not show the element of mechanically joining the ends of the cable core to the ends of the corrugated tube while the cable is on the cable drum for the reasons of record. The Examiner acknowledges such on page of the Office Action. However, the Examiner claims that Shibata (JP '624) teaches such an element in Figure 1 and paragraph [0009] and that it would be obvious to one of ordinary skill in the art to

combine such a mechanical joining from Shibata with the remaining steps from Hirose to arrive at the present invention as claimed.

Such an analysis is in error as Shibata does not show such an element. As noted in Shibata (abstract and paragraphs [0008-0010], a method is disclosed for making a superconducting cable having a core (1) and a heat insulating tape (2). The cable core is drawn off from a drum (21) and guided to a tube forming device (23) in which the insulated tube is continuously formed. A cable manufactured in this way is wound around a second cable drum 24. The end of the superconducting cable is connected to a supply device for liquid nitrogen. The liquid nitrogen is fed into the space between the cable core and the insulated tubing. The ends of tube 2 are sealed with a cap so that the core does not elutriate from an end of the feeder 25 by thermal expansion. However, nothing here suggests that Shibata teaches or suggests that the tube is of the corrugated type or that the ends of the cable are mechanically joined to the end of the tube while the cable is on the drum.

In fact, the method disclosed in Shibata is one of the prior art methods that the Applicants considered not to work and that the present invention is intended to overcome. When the liquid nitrogen in Shibata is fed into the space between the cable core (1) and the tube (2), the cable core contracts as it is cooled down to the temperature of the liquid nitrogen (approx. 70K). It is stated in Shibata that the cable core expands when returning to ambient temperature and will be formed in a snake like manner. This happens only when tube 2 maintains its length at a temperature of 70K as well as at ambient temperature. Thus, what in fact occurs is that tube 2 contracts as well when liquid nitrogen is fed into the space between core (1) and tube (2). This

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results in no difference in length of the cable core and the tube, either at ambient temperature or at the low temperature of 70K.

As such, the cited prior art, either alone or in combination with one another, do not teach or suggest all of the elements of the present invention as claimed. For example, even if the teachings of Shibata were combined with Hirose as suggested by the Examiner, the resulting method would still not teach or suggest a step of mechanically joining the ends of the cable core to the ends of the corrugated tube while the cable is on the cable drum. For at least this reason, Applicants respectfully request that the rejection of independent claim 5 and the corresponding rejections of dependent claims 6-8 be withdrawn as well.

In view of the foregoing, Applicant respectfully submits that the pending claims are currently in condition for allowance, the earliest possible notice of which is earnestly solicited. If the Examiner feels that a telephone interview would advance the prosecution of this application they are invited to contact the undersigned at the number listed below.

Respectfully submitted

SOFER & HAROUN, LLP

Dated: By: _____

Joseph Sofer
Reg. No. 34,438
317 Madison Avenue
Suite 910
New York, New York 10017
(212)697-2800